

Rapid Heart.

Thesis for M. D. Graduation 1891.

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7 HERIOT ROW,  
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My dear Fraser,

Thesis of Buckland on  
"Rapid Heart" may I think  
be sustained, though feeble.

Please don't forget to let  
me have the papers on  
Mr. D. Stamp duty as soon  
as possible for review.

L. S. Greenfull

## Rapid Heart.

Francis D. Buckland

Disturbances of the normal rate of the cardiac cycles independent of evidence of structural change in the heart itself and also independent of any one of those conditions which general experience has accepted as disposing or exciting causes of acceleration are sometimes perplexing in regard to diagnosis, prognosis and treatment. Irregularity of rhythm is common enough, is usually accompanied by increased frequency and exaggerated impulse, almost invariably causes discomfort and is most commonly associated with dyspepsia, peripheral irritation, gout or altered blood state. It is not, however, my intention to draw special attention to it, but since errors of rhythm and abnormal rapidity

sometimes accompany, or alternate with, one another it will be necessary to mention the condition.

Cases in which undue rapidity is the essential feature are not common, and if unexpectedly called upon to explain why a heart has suddenly commenced to beat at the rate of 200 or more per minute in the absence of evident cause, and to foretell what will be the result of such morbid activity on the part of the organ is likely to be embarrassing. With regard to therapeutics, too, one is apt to be involved in doubt.

In this subject, then, such conditions as valvular disease, changes in the muscular substance of the heart itself, stasis of pyrexia, the influence of poisons and of other morbid agents, the presence of undigested food or of worms in the alimentary tract producing peripheral irritation and palpitation are excluded. Further, abnormal blood stasis, whether

anemia or excessive richness in red corpuscles and fibrin are omitted. Setting aside then such recognized states and associated conditions as the above I shall treat of two classes of cases showing increased rate of the cardiac cycles - (a). those in which the heart exhibits paroxysms of abnormal rapidly varying in duration from a few hours to several days and occasionally for two or three weeks, and (b) those in which the affection lasts for prolonged periods as if it were congenital and proper to the individual.

In class (a) are those cases heretofore spoken of as "paroxysmal hurry", in which there are periodical exacerbations of speed far above the normal, the attacks being, as a rule, short in duration and frequent in return while the intervals between the paroxysms show considerable variation.

In class (b) are those cases in which the heart seems to be in a chronic state of morbid activity as if it had

contracted an ill-habit and as if its innervation were permanently perverted.

Concerning these conditions of rapid heart literature is far from voluminous. Dr. Broadbent has noted several cases in "The Pulse" pages 98-106, and Dr. Bristowe, in an article to "Brain" Vol X page 164, describes "paroxysmal hurry" as "recurrent palpitation of extreme rapidity in persons otherwise apparently healthy". Whatever exceptions may be taken to the terms used clinical observations are usually of interest and may be of some value. Palpitation is defined (Quain's Dictionary) as "abnormal movement of the heart whereby the force of the systolic contraction is increased to such a degree as to give rise to a sensation of discomfort or distress on the part of the patient." In neither of these conditions however, is palpitation so defined necessarily present, since it is often found that in a patient who suffers

from one of the disturbances of which  
I speak, the heart-beats <sup>number</sup> 100, ~~or~~ <sup>and</sup> even more <sup>per minute</sup>,  
while the patient experiences no distress  
or alarm whatsoever and is often capable  
of performing his, or her, ordinary  
occupation, and sometimes of undergoing  
considerable physical and mental  
exertion. Nevertheless, there is in many  
cases experienced violent palpitation  
which may be accompanied by pain in  
the region of the heart - both being so  
severe as to totally incapacitate the  
patient for any form of bodily or mental  
work.

It seems reasonable, therefore, to take  
objection to the term "paroxysmal hurry"  
being accounted synonymous with  
"recurrent palpitation".

The distinguishing feature of the heart  
is rhythmical action, and there are  
cogent reasons for believing that this  
characteristic is not due to the intrinsic  
ganglionic system of nerves alone, since  
accelerated action and errors of rhythm  
may be undoubtedly traced to irritation

of the pneumogastric and sympathetic. Given healthy muscular structure with healthy nerve mechanism, cardiac ganglia, vagus and nerves and ganglia of the sympathetic supplied by normal blood we may take it for granted that a heart will show neither abnormal rapidity, undue irritability, nor disorder of rhythm. We may also conclude that interference with any one of these factors of normal action may give rise to morbid activity in heart muscle which exhibits irritability in common with all muscular structures -

Abnormal blood status being, as I have said, excluded, it is evident that we have to deal with an affection which has been ~~termed~~ <sup>called</sup> "functional" - an unsatisfactory term inasmuch as it tells us little or nothing beyond the fact that there is disordered function, leaving us to surmise that some nutritive or other material change in the organ coexists. Concerning functional disorders of the heart experience has found that they

are either accompanied or unaccompanied by pain; that they are usually paroxysmal in character; that they may be slight and transient or varying in intensity and duration to considerable persistence with urgent symptoms of distress.

Indue rapidity associated with evidence of organic heart disease is well established and gives rise to no great surprise although it may be difficult to state why the acceleration or irregularity takes place - whether, in addition to the structural change, ~~there~~ some perversion of nerve influence be also in operation, and consequently whether the perturbation of cardiac action be not as much due to the latter as to the former.

Case. H. D. f. aged 26, married, had a systolic murmur at the apex. Whenever this woman stooped to tie her shoes or, when kneeling, leaned forward for the purpose of scrubbing she felt faint and experienced palpitation with distress. The pulse could not be counted at the wrist and with the stethoscope the

cardiac cycles were found to range between 210 and 260 per minute. She has had many such attacks varying in duration from two to twelve hours. Respiration was not so much disturbed as one would have anticipated, being 25 per minute without dyspnoea. This patient is decidedly neurotic.

Is such a case in the organic change adequate to cause the symptoms exhibited?

Whatever nomenclature be adopted cases which show paroxysmal attacks of variable duration and at varying intervals seem to be closely allied to those which are more persistent in character. Both seem to be due to some abnormal state of the cardiac nerve mechanism, the causation of both is similar, and, although the heart's systole almost invariably retains its force, death may ensue from sudden failure of the heart.

No form of peripheral irritation has, so far as I know, been traced as the

cause of protracted acceleration.  
Deformity of the chest, disease of the  
lungs or of the neighbouring structures  
might be exciting <sup>factors</sup>, but I can find no  
mention of them as such.

In considering those cases in which  
the undue rapidity is the essential  
feature, it will be well to agree upon  
a standard of pulsation. Taking the  
average rate of the cardiac cycles in  
healthy male and female adults under  
various conditions to range between  
70 and 90 per minute, we may justly  
consider that a rate of pulsations over  
90 errs on the morbid side and requires  
explanation. The phenomena and  
influence of childhood are not within  
the sphere of this subject.

Age.  
Sex.  
Paroxysms of rapid action of the heart  
are met with at all ages, but are most  
common during and after middle life.  
As regards sex, females predominate, being  
3 to 1 of males. I have twice observed  
paroxysms of excessive speed lasting  
for several days in those under 20 years

of age, but according to records these cases seem to be exceptions. Both showed disordered rhythm after the attacks. In adults the tendency is for the paroxysms to increase in frequency so that the affection appears to be progressive.

Circulatory  
phenomena.

Concerning the circulatory phenomena, pain is by no means invariably present nor can palpitation causing discomfort or distress always be recorded. In one case under my notice in March 1890 - a girl aged 12 with a distinctly neurotic family history, the heart beat at the rate of 205 per min. for 11 days. During the first five days of this heart-riot the patient was greatly disturbed by the palpitation and could not sleep, especially when lying on the left side, but during the last half of the period sleep was not interrupted nor was any palpitation or discomfort experienced, whatever position or attitude was assumed. There was no evidence of valvular disease and the heart maintained a good impulse throughout. There was hyperaesthesia,

especially on the back and Trousseau's  
tache cérébrale was elicited on various  
sites. The attack ceased quite suddenly  
and subsequently the heart was irregular.  
There had been many attacks of palpita-  
tion of a few hours duration for 5 or 6 years.  
This patient is now well, April 1891.

Sensation of faintness is very common.  
Respiration is accelerated and is, as a rule,  
shallow but dyspnoea is by no means  
usual. Pallor is invariably present;  
cyanosis and anasarca rare. The arteries  
tend to be contracted and the arterio-capillary  
resistance increased. If dropsy be present,  
there can be little doubt that dilatation  
~~of~~ of the heart has occurred.

Restlessness, insomnia, tinnitus aurium,  
headache, giddiness, neuralgia, dyspepsia,  
hyperaesthesia and obscure pains in  
muscles and joints are other nervous  
associations.

On inspection the apex beat is seen to be  
spread over an enlarged area and the  
excited action of the heart may be  
readily noticed. To the hand the impulse

is usually forcible and may be readily appreciated as high up as the 3<sup>rd</sup> interspace. Sometimes over the base and 2<sup>nd</sup> interspace there is evidence of considerable agitation, a kind of vibratory movement being imparted to the precordia. Increase in the area of dulness is often absent and, if present, is usually so slight as to pass undetected. The beats are rhythmical and the sounds loud and clear, especially when the impulse is maintained. Occasionally a murmur may be detected but it generally disappears after the paroxysm. The number of pulsations shows a wide range - 100 to 300 per minute. The pulse at the wrist is by no means a good indicator of the amount of activity displayed by the heart. It is regular with fair tension, full between the beats and vibrative. The low tension of febrile disorders is absent and diastole is exceptional.

Cause - With regard to causation, in many cases nothing definite can be stated. The following, however, have been assigned

as causes and may be accepted with little hesitation. Mental and physical overstrain, shock, worry and anxiety, fight, excitement, venereal excesses and masturbation; general nervous debility, special temperaments and idiosyncrasies. Of these excessive muscular exercise, nervous exhaustion, shock, excitement, venereal excesses and masturbation are particularly noteworthy. The predisposition, however, is most important, and if overwork or anxiety be superadded some error of rhythm, which on slight provocation may be changed into excessive frequency, is likely to ensue.

Such nerve-storms as those exhibited in chorea apart from a hereditary taint may undoubtedly be initiated by fright. In this disease, though the rapidity is not extreme, the cycles are generally increased in number and are sometimes irregular.

Diagnosis Neither the presence nor absence of

physical signs of disease are conclusive, since there may be a temporary bruit in one of the valvular areas and there may be lesions which give no evidence of their existence. Repeated examination and the absence of the conditions stated *initio* and of secondary changes indicative of heart disease must be our guides. Given excessive sudden agitation with increased and diffused impulse, perfect rhythm, sounds increased in intensity and heard over a larger area than is proper to them, normal position and dimensions of the cardiac area and the pulse not partaking of the simulated force of the heart, an excited functional state may be assumed, whether there be an attack of a few hours duration or the condition be protracted for months. Rhythmical disorder accompanied by pain in the absence of murmur undoubtedly suggests perversion of nerve influence, and since irregularity and undue rapidity may be observed in one and the same case it seems justifiable to place

instances of tachycardia amongst  
neuroses.

Prognosis

Prognosis depends to some extent upon the age of the patient but should always be guarded. In the young there is a good chance of recovery and where the attacks are short in duration a structurally sound heart may be implied and a ~~good~~ favorable result anticipated.

If, however, there be periods of rapidity increasing in frequency and duration the case is undoubtedly serious and where the ~~of~~ rapidity is the only sign of circulatory disturbance and has persisted for weeks the danger is extreme. Furthermore, many cases terminate suddenly, as if from cardiac syncope, and others from gradual heart failure. It is therefore, rash to be sanguine in any case since a fatal issue may be brought about by sudden mental shock even in a patient liable to comparatively slight attacks. Frequent and prolonged attacks of

functional disorder are seen to occur without producing distinct morbid states or other sequela, though long continuance often brings about loss of bodily vigour and mental aberration.

It is extremely difficult in the absence of any evidence of organic lesion, and even where during the period of morbid rapidity a murmur has been detected disappearing after the paroxysm, and also in the absence of any history of one of those causes known to give rise to structural change, to decide whether the disturbance of the cardiac cycles has not produced such alteration in structure. Where the issues have been fatal post-mortem examinations seem to have been very few in number. For one fatal case recorded by Dr. Bristowe in the article to "Brain" mentioned, examination showed slight dilatation and hypertrophy but perfectly healthy valves and muscular tissue. Enlarged and degenerated hearts are seen without anything being found to explain the rapid action that has

occurred.

It seems reasonable to conclude that such structural disease, whether inflammatory or degenerative is secondary to the nervous implication and that dilatation is the consequence and not the cause of the disturbance in many cases. That the muscular substance of a heart set to beat at the rate of 200 or more per minute owing to injury to, or disturbance of, its normal innervation should become overwrought and lose its tone so that dilatation occurs is highly probable. In some cases such dilatation may be merely temporary.

D. S. West (Paper read before the Medical Society March 10<sup>th</sup> 1890) is of opinion that cases which show paroxysms are due to an organic lesion of the muscular substance which may be in some cases interstitial myocarditis consequent perhaps on rheumatic pericarditis or syphilis, and thus related to fibroid disease of the heart. The fact that the attacks so frequently terminate

quite suddenly is, I think, contrary to this suggestion and points to the affection being one of some part or parts of the nervous system rather than to its being one of the myocardium. Where the perturbations subside <sup>gradually</sup> the condition is very suggestive of myocarditis even though attacks of less severity occur subsequently - due possibly to some latent irritability resulting in a weakened organ which might post-mortem show some interstitial change.

The results of pathological investigation having so far been negative propositions concerning the nature of this affection can only be regarded as speculative. Stimulation of the accelerating cardiac nerves or paralysis of the cardiac terminations of the vagus do not seem to be sufficient to account for such a high rate of speed as 250 to 300 or thereabouts. For complete abeyance of the function of the inhibitory nerve the rate of the cycles in the dog are trebled while in

man the number of pulsations may be doubled (Kando's and Stirling, page 127) giving a maximum of 160-180.

A rate of over 200 beats per minute is common in these disorders so that if the roots or terminals of the vagus be implicated some other nerve influence appears to be also at fault - whether that of the intrinsic ganglia of the heart or the sympathetic, or of both of these. Most of the attributed causes point to a general depressed state of the nervous system while in cases where <sup>there</sup> is a strong history of physical overstrain it is more than probable that the mischief is in the heart itself. In a case under ~~my~~ <sup>my</sup> notice only a few weeks ago - a man aged 26 accustomed in his youth to run in long races and paper-chases - there had been attacks of palpitation accompanied by pain. Whenever he rises from the recumbent posture the heart-beats number 110-115 and a whizzing sound is heard in the mitral and pulmonary areas. In a minute or two the heart

Heart seems to recover itself and the murmur disappears. I must not omit to mention that he is extremely excitable and works hard in his vocation as a clergyman. The area of cardiac dulness could not be noted as passing the normal limits.

As regards the circulation, the vibratory condition of the pulse appears to indicate that the onward flow of the blood is slow. Either the ventricle does not fill during the diastole or does not empty itself during the systole. The diastole is therefore too short to admit of a normal influx of blood or the ventricle is overdistended. Were the ventricle in a state of spasm pain of considerable severity would be almost inevitable. Although physical signs do not usually indicate overdistension I think that the cavity of the ventricle is enlarged and that it is not completely emptied by the systole. In the case of a child aged 11, where the disturbance had lasted for 9 days there was ~~symptoms~~

slight increase of dulness with a soft mitral bruit which entirely disappeared on recovery.

There are some points in the etiology, symptoms and results which lead me to assume that these disturbances of the heart are allied to the affection known as Graves' disease, Basedow's disease or Exophthalmic goitre - for example, the causes assigned are similar; the rate of the cardiac cycles may be normal with paroxysmal increases or the abnormally rapid action may persist. The increased rate may be slight, the pulse not exceeding 100 per minute, but usually the rate is higher, 120-150 increased by excitement to 200 per minute. The normal impulse is maintained; the rapid action is frequently the first indication of disturbance and may be the only manifest sign for a considerable period, while palpitation is usually the symptom first noticed by the patient, the increase in the number

of the heart - beats preceding the  
vaso-motor derangement. Moreover,  
where marked improvement has taken  
place in Graves' disease the patients  
are liable to attacks of palpitation  
or of nervous exhaustion on being  
subjected to slight physical or mental  
strain. Again, both conditions are often  
fatal and death in both seems to be  
the result of the cardiac affection and  
the general weakness resulting therefrom.  
There may be the ordinary symptoms  
of cardiac failure or the end may be  
sudden with signs of syncope.

In fatal cases of Graves' disease the  
heart is usually found to be dilated  
and hypertrophied, but not to any  
marked extent, with no organic change  
in the myocardium or valves, unless  
the patient be advanced in years when  
the walls may be attenuated and  
doubtless showing degenerative changes.  
Furthermore, there is <sup>in Graves' disease</sup> the tendency to  
impaired mental vigour together with  
various signs of nervous derangement,

Such as excitements, irritability, dyspepsia and hyperaesthesia of a general kind which accompanies depressed nervous states dependent upon a general immutrition.

The vaso-motor derangement which characterises Graves' disease is, however, absent in cases of tachycardia so that the difference between the two states appears to be one of extent of nerve implication and not of intensity.

In Esophthalmic goitre increase of connective tissue and diminution of ganglionic cells has been observed in the lower cervical sympathetic ganglia (Quain's Dict. - Lander Brunton), yet science is not satisfied concerning the exact pathology of this condition.

I think, therefore, that these cases of rapid heart must be regarded as neurosis and until the present state of our knowledge concerning functional disorders is improved it will be necessary so to regard them.

Treatment.

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Treatment. With reference to therapeutics I must say that little satisfaction has been experienced. Digitalis and heart tonics are sometimes of value in mild cases, but in severe cases they are almost always useless. If the arterio-capillary resistance be increased, as I have stated, doubtless Digitalis does more harm than good. Should, however, there be signs of dilatation with cyanosis and dropsy it should be given. Bromine and Iodine appear to have no effect whatever.

Ether and Ammonia are naturally suggested but their administration is likely to cause disappointment in the way of steadying the excited action of the heart, though, seeing that death may occur from sudden or gradual heart failure, they may tend to avert a fatal issue. I am inclined to think that Strychnine may be regarded with a certain amount of favour. For cases in which the heart is irregular in its action, irritable and liable to beat with undue speed on very slight provocation I have found

it useful. Such patients on close questioning rarely fail to mention some cause which is liable to produce depression and nervous exhaustion.

D. S. West has met with some success from the use of Nitrite of Amyl in paroxysmal attacks.

The action and utility of Belladonna deserve investigation - applied in the form of plaster over the precordia it appears to give relief - possibly more as a mechanical agent than as a medicinal one.

The virtues of alcohol are questionable. Hyocyamus, Camphor and Valerian may be borne in mind, but I have not myself had opportunity of giving them a trial.

The application of the constant current - to the great nerves in the neck and to the precordia has some merits. I have tried it in two or three cases and regard it as a useful expedient. It should be used once or twice daily and persisted in as long as the rapidity

continues. It is unfortunate that it requires so much time and patience, but there is no doubt of its efficacy in functional neuroses and nervous palpitation.

On the whole I should rely upon absolute rest in bed, a stringent dietary, the administration of Strychnine, <sup>combined</sup> with Iron if, as is often the case, there be anaemia, with Digitalis or Strophanthus on evidence of dilatation and the continuous Galvanic current to the region of the great nerves of the neck and to the precordium.

Francis S. Buckland -

April 1891.